REMARKS

Status of Claims

Claims 1, 2, 6, and 11 are pending, with claims 1 and 11 being independent. Claims 1, 6, and 11 have been amended to correct a typographical error in the structure of the pyridone azo compound of formula (2). Support for the amended claims may be found throughout the specification including the original claims. Therefore, no new matter has been added.

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments, the following remarks, and the attached declaration under 37 C.F.R. §1.132.

Claim Rejections under 35 U.S.C. § 112, second paragraph

Claims 1, 2, 6, and 11 are rejected under 35 U.S.C. § 112, second paragraph as allegedly being indefinite. In response, claims 1, 6, and 11 have been amended to correct a typographical error in the structure of the pyridone azo compound of formula (2). As such, the structure of formula (2) has been amended to insert a nitrogen into the ring to provide a pyridin-2-(1*H*)-one ring. Accordingly, Applicants respectfully submit that the rejection has been obviated and respectfully request withdrawal of the rejection.

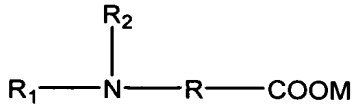
Claim Rejections under 35 U.S.C. § 103

Claims 1 and 2 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsutsumi (U.S. Patent No. 6,031,019) or Komatsu (U.S. Patent No. 6,379,443) either of which in view of Ohyama (U.S. Patent No. 5,359,075). Applicants respectfully disagree with this rejection; therefore, the rejection is traversed.

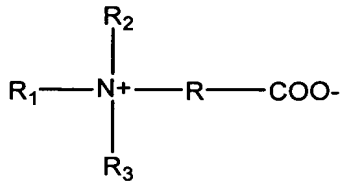
Tsutsumi relates to an aqueous ink for inkjet printing that contains at least one compound selected from the group consisting of compounds (a) to (d):

(a) an amino acid or salt thereof,

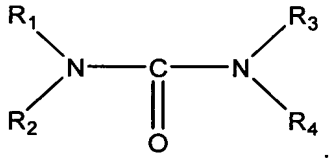
(b) a substantially water-soluble compound represented by formula (1)



(c) a substantially water-soluble compound represented by formula (2)

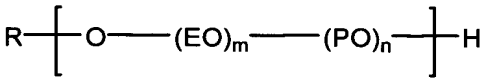


(d) a substantially water-soluble compound represented by formula (3)



Tsutsumi teaches that the amino compounds of (a) to (d) serve to impart moisture retention to the aqueous ink to secure ink dispersion stability and ejection properties. The inks of Tsutsumi also comprise a polymer emulsion. Tsutsumi teaches that the polymer emulsion can be an emulsion of fine polymer particles colored with a colorant. (Col. 3, lines 65-67). Tsutsumi teaches that the colorants to be used in the ink include dyes, such as oil-soluble dyes (oil colors), disperse dyes, direct dyes, acid dyes, and basic dyes, and pigments, all of which are commonly known to those of skill in the art.

Komatsu relates to an ink composition for printing on a heated recording medium. The ink compositions of Komatsu comprise a colorant, a water-soluble organic solvent, water, and at least one compound represented by the following formula (I):



The ink composition of Komatsu is formulated to print on a recording medium heated to a temperature of or above the cloud point of the compound of formula (I). The colorants of Komatsu can be a pigment directly included in the ink composition or a resin colored with dyes or pigments. Komatsu teaches a variety of organic and inorganic pigments and dyes, all of which are well-known to those of skill in the art.

Ohyama relates to quinophthalone compounds suitable for coloring liquid crystal materials. Ohyama discloses that the substituents on the 2H-indene-1,3-dione (R_3 and R_4) are selected from a very broad class of substituents including a vast number of

specific substituents. The large number of very broad classes of substituents include hydrogen, alkyl group, N-substituted aminocarbonyl group, a heterocyclic ring, or R_3 and R_4 collectively with the ring carbon atoms to which they are attached can form an N-substituted maleimide ring. Ohyama provides that the preferred N-substituted aminocarbonyl group has 2 to 18 carbon atoms. As such, the N-substituted aminocarbonyl groups of Ohyama range from methyl substituted aminocarbonyl groups (i.e., CON(methyl)$_2$ or CON$(CH_3)_2$) providing two (2) carbon atoms to n-nonyl substituted aminocarbonyl groups (i.e., CON(nonyl)$_2$ or CON$(C_9H_{19})_2$) providing eighteen (18) carbon atoms. The only examples provided by Ohyama of R_3 being N-substituted aminocarbonyl groups with R_4 being hydrogen are CONHC_4H_9(n), CONHC_6H_{13}(n), CON$(C_3H_7(n))_2$, and CON$(C_4H_9(n))_2$.

Ohyama discloses that the selected quinophthalone compounds have a high solubility in a liquid crystal material and the liquid crystal material can be colored and dyed at a high concentration and maintain a sharp and transparent color tone. (Col. 5, line 63 – Col. 6, line 1). Accordingly, the quinophthalone compounds of Ohyama are selected and developed as a coloring matter for liquid crystal materials. Applicants maintain that developing and selecting a coloring matter for liquid crystal materials is a significantly different technical field than developing and selecting a coloring matter suitable for an aqueous ink for ink jet recording. Applicants respectfully submit that Ohyama does not disclose or suggest applicability for aqueous ink for inkjet recording.

In contrast to the above-cited documents, the presently claimed invention relates to an aqueous ink for inkjet recording comprising water and a resin, wherein the resin is colored by a water-insoluble coloring matter selected from specifically claimed compounds. The specification also discloses that the claimed aqueous ink comprising resin colored by the water-insoluble coloring matter selected from the specifically claimed compounds has excellent storage stability, fixability to the recording medium, vividness of recorded image, light resistance, and water resistance. (page 55, 1st paragraph and Table 3). Evidence of these excellent properties is provided in the attached declaration under 37 C.F.R. § 1.132 by Taizo Nishimoto.

The presently claimed aqueous inks comprise water and a resin as the main components, wherein the resin is colored with coloring matter selected from specifically claimed compounds. The coloring matter is selected from a specifically claimed class of c of formula (1), a specifically claimed class of pyridone azo compounds of formula (2), or mixtures thereof. In the quinophthalone compounds of formula (1), the 2H-indene-1,3-dione is substituted (at R_3) with a substituent $CONR_4R_5$ in which both R_4 and R_5 are a ***linear*** alkyl group having ***10 or more*** carbon atoms or a ***branched*** alkyl group having ***8 or more*** carbon atoms. Attached is a declaration under 37 C.F.R. § 1.132 by Taizo Nishimoto demonstrating the unexpected results of these presently claimed aqueous ink.

As demonstrated in the declaration, the compounds of formula (1), with R_3 being $CONR_4R_5$ in which both R_4 and R_5 are a linear alkyl group having 10 or more carbon atoms or a branched alkyl group having 8 or more carbon atoms, exhibit excellent characteristics in comparison to those which have linear or branched alkyl groups of a shorter length than presently claimed. In particular, as demonstrated in the declaration the presently claimed quinophthalone compounds have unexpectedly high OD values in comparison to quinophthalone compounds substituted with $CONR_4R_5$ in which both R_4 and R_5 are a linear or branched alkyl groups of a shorter length than presently claimed.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP § 2143.

It is respectfully submitted that even if there were some suggestion or motivation to combine the reference teachings and a reasonable expectation of success, the cited references even when combined do not teach or suggest all the claim limitations.

The inks of Tsutsumi and Komatsu and the colorants for liquid crystal materials of Ohyama are significantly different than the presently claimed inks. The inks of Tsutsumi comprise a polymer emulsion and at least one of the amine compounds of (a) to (d) to impart moisture retention to the aqueous ink to secure ink dispersion stability and

ejection properties. The polymer emulsion of Tsutsumi is an emulsion of fine polymer particles impregnated with water-insoluble or sparingly water-soluble well-known colorants. The inks of Komatsu comprise a water soluble organic solvent, water, a colorant, and an ethyleneoxy/propyleneoxy compound. The inks of Komatsu are specifically formulated to print on a recording medium heated to a temperature of or above the cloud point of the ethyleneoxy/propyleneoxy compound. The colorants of Komatsu can be any one of a long list of well-known pigments or a resin colored with well-known dyes or pigments. Ohyama discloses quinophthalone compounds, having high solubility in a liquid crystal material, wherein the substituents on the 2H-indene-1,3-dione ring of the quinophthalone compounds (i.e., R_3 and R_4) are selected from a large no of very broad classes of substituents, these classes including a vast number of specific substituents.

Accordingly, even if combined, it is respectfully submitted that neither Tsutsumi and Ohyama or Komatsu and Ohyama disclose or suggest the specifically claimed aqueous inks comprising water and a resin, wherein the resin is colored with coloring matter selected from a specifically claimed class of quinophthalone compounds of formula (1), a pyridone azo compounds of formula (2), or mixtures thereof, wherein in the quinophthalone compounds of formula (1), the 2H-indene-1,3-dione is substituted (R_3) with a substituent $CONR_4R_5$ in which both R_4 and R_5 are a linear alkyl group having 10 or more carbon atoms or a branched alkyl group having 8 or more carbon atoms.

Applicants respectfully submit that, as demonstrated in the attached declaration under 37 C.F.R. § 1.132, resin colored with the specifically claimed quinophthalone of formula (1), with R_3 being $CONR_4R_5$ in which both R_4 and R_5 are a linear alkyl group having 10 or more carbon atoms or a branched alkyl group having 8 or more carbon atoms, exhibit excellent characteristics in comparison to those which have alkyl groups of a shorter length. In particular, as demonstrated in the declaration the presently claimed quinophthalone compounds have unexpectedly high OD values in comparison to quinophthalone compounds substituted with $CONR_4R_5$ in which both R_4 and R_5 are a linear or branched alkyl groups of a shorter length than presently claimed.

Therefore, it is respectfully submitted that even if the cited art documents are combined, they do not teach or suggest all the claim limitations.

Moreover, Applicants maintain that the teachings of Tsutsumi and Komatsu do not suggest or provide any motivation to combine any feature of Tsutsumi or Komatsu with Ohyama. There is no teaching or suggestion in Ohyama of using the quinophthalone compounds in an aqueous inkjet ink composition. It is also respectfully submitted that Tsutsumi, which is related to amine compounds for imparting moisture retention to an aqueous ink to secure ink dispersion stability and ejection properties, does not suggest or provide any motivation to use quinophthalone compounds of Ohyama suitable for coloring liquid crystal materials. It is further respectfully submitted that Komatsu, which is related to an ink composition suitable for printing on a heated recording medium and thus containing certain ethyleneoxy/propyleneoxy compounds, does not suggest or provide any motivation to use quinophthalone compounds of Ohyama suitable for coloring liquid crystal materials.

Furthermore, Applicants respectfully maintain that there is no a reasonable expectation of success in combining the inks of Tsutsumi or Komatsu with the quinophthalone compounds of Ohyama suitable for coloring liquid crystal materials. Applicants respectfully submit that the evaluation of properties of a coloring matter for use in liquid crystal materials would not be the same as the evaluation of properties of an aqueous ink for printing a colored image on paper. By way of example, it is respectfully submitted that evaluating the light-fastness of a coloring matter within a liquid crystal device would not be the same as evaluating light-fastness of a colored image printed on paper. Accordingly, it is respectfully submitted that there is no reasonable expectation of success in combining the inks of Tsutsumi or Komatsu with the quinophthalone compounds of Ohyama suitable for coloring liquid crystal materials.

Therefore, for at least the reasons noted above, Applicants respectfully request withdrawal of the obviousness rejections.

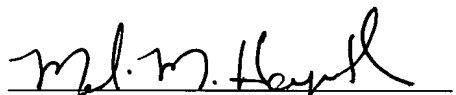
Conclusion

For at least the reasons noted above, the art of record does not disclose or suggest the inventive concept of the present invention as defined by the claims.

In view of the foregoing amendments and remarks and the attached declaration under 37 C.F.R. §1.132, reconsideration of the claims and allowance of the subject application is earnestly solicited. The Examiner is invited to contact the undersigned at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: 

Melissa M. Hayworth
Registration No. 45,774

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620
Date: April 4, 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Yoriaki MATSUZAKI et al. Art Unit: 1714

Application No. : 09/806,340 Examiner: C. Shosho

Field March 29, 2001

For : YELLOW HUE COMPOUND AND AQUEOUS INK FOR INK-JET RECORDING SYSTEM USING THE SAME

DECLARATION

Honorable Commissioner of Patent and Trademarks

Washington, DC 20231

Sir:

Taizo NISHIMOTO declares and states that:

1. He is one of the joint applicants in the above application.

2. He has graduated from Kyoto University, Kyoto, Japan, with a master degree in department of agricultural chemistry in March 1993. Since April 1993, he has been employed by Mitsui Chemicals Inc., the assignee of the above application. Since April 1993, he has been engaged in research and development of coloring matter at the Central Research Institute in the Company.

3. He has studied the Office Action of October 4, 2004.

4. The following experiments have been conducted by him or under his direct supervision:

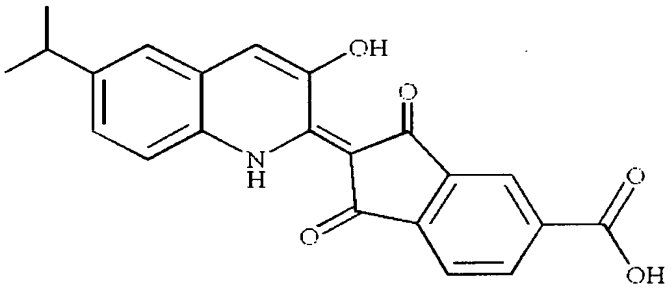
EXPERIMENTS

1. Synthesis of Coloring Matter

Coloring matter A-1 in Table 1 was synthesized by the following process.

285 Parts of sulfolane was added to 21.1 parts of trimellitic anhydride, and the solution was heated to 185°C. Further, 24.6 parts of 3-hydroxy-2-methyl-6-isopropylquinoline-4-carboxylic acid was added to the solution, and reacted at 200°C for 1 hour.

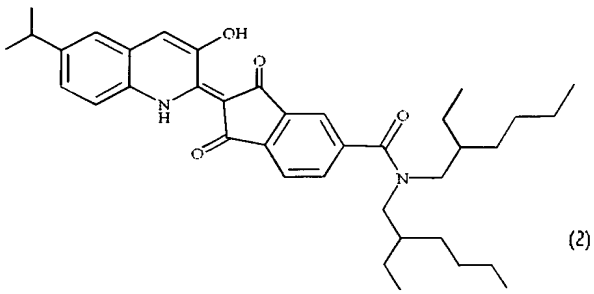
37.2 Parts of the compound of the formula (1), which is the precursor of the desired product, were obtained.



(1)

5 Parts of the compound of the formula (1) was added to 25 parts of o-dichlorobenzene, the mixture was heated at 100℃. 3.6 Parts of thionyl chloride was added dropwise to the mixture and maintained at the temperature for 2.5 hours and excess thionyl chloride was distilled off under reduced pressure. Further, 15 parts of di(2-ethylhexyl)amine was added dropwise at 100℃ and maintained at the temperature while stirring for 2 hours and then was cooled to room temperature.

The resulting reaction mixture was discharged in 50 parts of methanol to obtain 6 parts of the coloring matter A-1 represented by the formula (2);



(2)

Maximum absorption wavelength (λ max) of the coloring matter in toluene was 453 nm and 429 nm, and gram absorption coefficient (ε g) in 453 nm was 90600ml/gcm. The elemental analysis values of the compound were shown below.

Elemental analysis

	C	H	N
Found (%)	76.3	8.4	4.6
Calculated (%)	76.2	8.4	4.7

The compound had high solvent solubility, and had 30% or more solubility in toluene at room temperature.

2. Production of Colored Resin Fine Particles and a Dispersion thereof

To an autoclave equipped with a thermometer and a stirrer, 180 parts of dimethyl terephthalate, 10 parts of pentasodium sulfoisophthalic acid dimethyl ester, 130 parts of ethylene glycol, 25 parts of tricyclodecanedimethanol and 0.1 part of tetrabutoxytitanate was charged, and the mixture was heated at 180 to 220°C for approximately 3 hours for transesterification. Subsequently, the reaction mixture was heated to 240°C, the pressure in the autoclave was then lowered slowly to 10 mmHg, and the reaction was continued for 1 hour. The pressure in the autoclave was returned to atmospheric pressure to obtain a copolyester resin.

Then, 100 parts of the resulting polyester resin, 150 parts of methyl ethyl ketone, 150 parts of tetrahydrofuran and 10 parts of the coloring matter for

ink-jet recording indicated at A-1 in Table 1 were mixed.

Thereafter, 600 parts of deionized water was added thereto, and these were further mixed. This mixture was filtered through a 0.8-micron membrane filter, and heated to distill off the solvent. After cooling, deionized water was added to adjust the solid content to 20% by weight. Thus, a dispersion of colored resin fine particles was obtained. The resin fine particles dispersed in the dispersion were fine particles of the resin colored in yellow tint, having an average particle diameter of 0.2 μm.

3. Evaluation of characteristics

Glycerin and deionized water were added to the dispersion of the colored resin fine particles to obtain aqueous ink having a solid content of 15% by weight.

This aqueous ink was charged into an ink cartridge for a piezo-type ink jet printer, and printing and image recording were conducted with this printer.

The tests were conducted with respect to the following items.

The results are shown in Table 2.

The evaluation standards of the test items are described below.

(a) Evaluation of an image recording density:

The plain paper having the recorded image was measured for the recording density (OD value) using a reflection densitometer (manufactured by Macbeth) to evaluate the image recording density.

(b) Evaluation of a storage stability of ink:

In order to evaluate the long-term storage stability thereof (storage at 40℃ for 6 months), the conditions of the aqueous ink after these storages were visually observed. Further, the recording was conducted continuously with the printer for a long period of time, and the clogging was observed.

F-1 : Conditions after storage of the ink

Evaluation standard:

No problem without any precipitate or any floating matter. : ○

Problematic with a precipitate and a floating matter observed :×

F-2 : Clogging

: Evaluation standard:

Normal : ○

Abnormal : ×

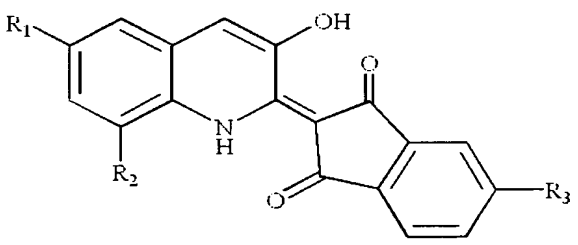
4. Experiment

Ink was produced by the above-mentioned process using the coloring matters for ink jet recording shown in Table 1, and the ink characteristics were evaluated.

Table 1

Coloring Matter No.	Formula		
	R_1	R_2	R_3
C-1	$C_3H_7(i)$	H	$CON(C_8H_{17})_2$
C-2	$C_3H_7(i)$	H	$CON(C_6H_{13})_2$
A-1	$C_3H_7(i)$	H	$CON[CH_2CH(C_2H_5)C_4H_9]_2$
A-2	$C_3H_7(i)$	H	$CON[C_8H_{17(i)}]_2$
A-3	$C_3H_7(i)$	H	$CON[CH_2CH(CH_3)C_5H_{11}]_2$
A-4	$C_3H_7(i)$	H	$CON[CH(CH_3)C_6H_{13}]_2$
B-1	$C_3H_7(i)$	H	$CON[C_{12}H_{25}(n)]_2$
B-2	$C_3H_7(i)$	H	$CON[C_{10}H_{21}(n)]_2$

note 1) Formula



5. Conclusion

The results of the above experiments were shown in Table 2.

The coloring matters of A-1 to A-4 are substituent R_3 represented $-CONR_4R_5$ in which both R_4 and R_5 are a branched alkyl group having 8 or more carbon atoms, and the coloring matters of B-1 and B-2 are both R_4 and R_5 have a linear alkyl group having 10 or more carbon atoms.

On the contrary, both R_4 and R_5 of the coloring matters of C-1 and C-2 are a linear alkyl group having 8 carbon atoms or 6 carbon atoms.

As seen from Table 2, All the aqueous inks using the coloring matters for ink jet recording of A-1 to A-4, B-1 and B-2 were higher OD value than those of the coloring matter of C-1 and C-2, and also excellent in the long-term storage stability.

Table 2

Coloring Matter No.	Evaluation of Characteristics			
	C		F-1	F-2
		OD value	After 6 month	After 6month
C-1	○	1.01	×	×
C-2	○	1.02	○	○
A-1	◎	1.25	○	○
A-2	◎	1.21	○	○
A-3	◎	1.19	○	○
A-4	◎	1.24	○	○
B-1	◎	1.18	○	○
B-2	◎	1.28	○	○

The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of document or any registration resulting there from.

Date: February 26, 2005

Taizo NISHIMOTO

Taizo Nishimoto